

PATENT COOPERATION TREATY

Rec'd PCT TO 10 DEC 2004

From the INTERNATIONAL BUREAU

10/518156

PCT

To:

KUISMA, Sirpa, Tuulikki  
Page White & Farrer  
Runeberginkatu 5  
10th Floor  
FIN-00100 Helsinki  
FINLANDE

RECEIVED

29. 11. 2004

**THIS PAGE IS BLANK**

REVISED VERSION

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
31 December 2003 (31.12.2003)

PCT

(10) International Publication Number  
**WO 2004/001982 A1**

(51) International Patent Classification<sup>7</sup>: **H03M 13/27**  
(21) International Application Number:  
PCT/FI2003/000499  
(22) International Filing Date: 18 June 2003 (18.06.2003)  
(25) Filing Language: English  
(26) Publication Language: English  
(30) Priority Data:  
20021222 20 June 2002 (20.06.2002) FI  
(71) Applicant (for all designated States except US): **NOKIA CORPORATION** [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI).  
(72) Inventor; and  
(75) Inventor/Applicant (for US only): **SEBIRE, Benoist** [FR/FI]; Sateentie 6 B 115, FIN-02100 Espoo (FI).

(81) Designated States (*national*): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK (utility model), SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

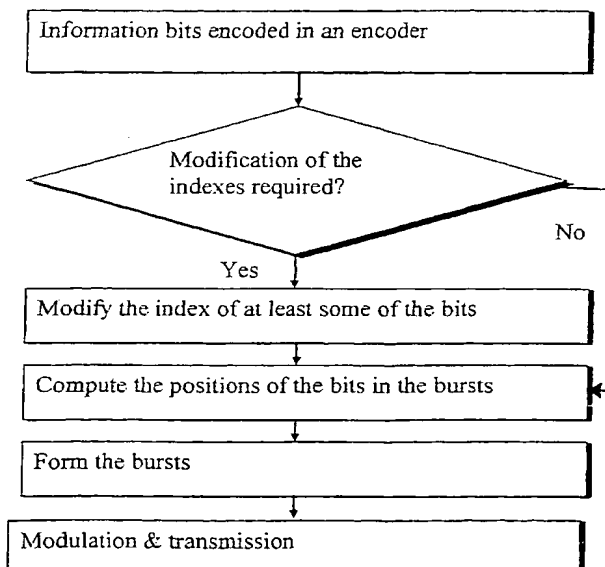
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(74) Agent: **KUISMA, Sirpa, Tuulikki**; Page White & Farrer, Runeberginkatu 5, 10th Floor, FIN-00100 Helsinki (FI).

Published:  
— with international search report

[Continued on next page]

(54) Title: INTERLEAVING OF INFORMATION BITS



(57) Abstract: The present invention relates to a method in a transmitter for interleaving information bits from a data block into transmission bursts. Each of the information bits is assigned with an index. The interleaving comprises computing positions of the information bits in the transmission bursts such that the values of the indexes of at least a portion of the information bits are modified. At a receiver it is determined if the value of any of the indexes has been modified before transmission of the transmission bursts. Based on the determination, de-interleaving of the information bits is then accomplished based on modified values of the indexes or originally assigned values of the indexes.

WO 2004/001982 A1



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

**(88) Date of publication of the revised international search report:**  
25 November 2004

**(15) Information about Correction:**

see PCT Gazette No. 48/2004 of 25 November 2004, Section II

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 2003/000499

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H03M 13/27

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H03M, H04L, H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ, INSPEC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	LEI, Sai-Weng et al. "Performance analysis of adaptive interleaving for OFDM systems". IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, May 2002, Vol. 51, No. 3, pages 435-444, ISSN: 0018-9545, INSPEC AN: 7292092, see section III, "Adaptive Interleaving". --	1-5,7-10
A	US 2002044612 A1 (SIPOLA, J.), 18 April 2002 (18.04.2002), abstract --	1-10
A	EP 0980162 A1 (NOKIA MOBILE PHONES LTD.), 16 February 2000 (16.02.2000), abstract --	1-10

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

22 Sept 2004

Date of mailing of the international search report

04-10-2004

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Markus Stålö /MP

Telephone No. +46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 2003/000499

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9907076 A2 (SAMSUNG ELECTRONICS, LTD.), 11 February 1999 (11.02.1999), abstract  --	1-10
X	TAKESHITA, O.Y. et al "New classes of algebraic inte interleavers for turbo-codes"Information Theory,1998 Proceedings.1998 IEEE International Symposium on Meeting Date: 08/16/1998-08/21/1998; Publication Date: 16-21 Aug 1998; Location; Cambridge, MA, USA; On page(s); 419-; References Cited: 4; IEEE Catalog Number: 98CH36252; Number of Pages: xxvii+484; INSPEC Accession Number: 6188963: see Example I.1 and Theorem I.2  -- -----	1-5,7-10

## INTERNATIONAL SEARCH REPORT

Information on patent family members

03/09/2004

International application No.

PCT/FI 2003/000499

US	20020044612	A1	18/04/2002	AU	2852901	A	27/08/2001
				EP	1169779	A	09/01/2002
				FI	4671	U	25/10/2000
				FI	108822	B	00/00/0000
				FI	20000312	A,V	15/08/2001
				WO	0161869	A	23/08/2001
-----							
EP	0980162	A1	16/02/2000	FI	106491	B	00/00/0000
				FI	981744	A	13/02/2000
				US	6563884	B	13/05/2003
-----							
WO	9907076	A2	11/02/1999	BR	9811299	A	05/12/2000
				CA	2295791	A	11/02/1999
				CN	1264509	T	23/08/2000
				EP	0997031	A	03/05/2000
				JP	3492632	B	03/02/2004
				JP	2001512914	T	28/08/2001
				JP	2004040818	A	05/02/2004
				RU	2193276	C	20/11/2002
				US	6289486	B	11/09/2001

**THIS PAGE IS BLANK**